SliceGPT: Compress Large Language Models by Deleting Rows and Columns

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Abstract

Large language models have become the cornerstone of natural language processing, but their use comes with substantial costs in terms of compute and memory resources. Sparsification provides a solution to alleviate these resource constraints, and recent works have shown that trained models can be sparsified post-hoc. Existing sparsification techniques face challenges as they need additional data structures and offer constrained speedup with current hardware. In this paper we present SliceGPT, a new post-training sparsification scheme which replaces each weight matrix with a smaller (dense) matrix, reducing the embedding dimension of the network. Through extensive experimentation, we show that SliceGPT can remove up to 25% of the model parameters (including embeddings) for LLAMA2-70B, OPT 66B and Phi-2 models while maintaining 99%, 99% and 90% zero-shot task performance of the dense model respectively. Our sliced models run on fewer GPUs and run faster without any additional code optimization: on 24GB consumer GPUs we reduce the total compute for inference on LLAMA2-70B to 64% of that of the dense model; on 40GB A100 GPUs we reduce it to 66%. We offer a new insight, computational invariance in transformer networks, which enables SliceGPT and we hope it will inspire and enable future avenues to reduce memory and computation demands for pre-trained models. Code is available at: https://github.com/microsoft/TransformerCompression